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Observations on the Anatomy of the Paca of Brazil, (Cœlogenus, F. Cuv.)

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The specimen of the Paca from which I have taken the following observations, was a full-grown male, measuring 2 feet 7 inches along the back, from the point of the nose to the anus, and having a circumference of 21 inches round the belly, and 17 inches round the chest immediately behind the fore-legs. It was purchased from an American vessel at Liverpool, and, after two years' confinement in a travelling menagerie, it died of tubercular disease, which affected almost every organ of the thorax and abdomen. The skin of the animal being perfectly entire, and presenting a fine view of the characters of the adult Paca, forms an interesting preparation in the Museum of the University. The carcase was presented to me for dissection by Professor Jameson. This animal is an inhabitant of the moist and sultry plains of South America, and has never been met with in any other part of the globe. It abounds in Brazil, Guiana, and Paraguay, where it lives and breeds, like a rabbit, in burrows on the banks of rivers. It generally produces one at a birth; it lives on vegetable food; it is easily domesticated, and its flesh forms an esteemed article of food in the countries it inhabits. This animal has been known to European naturalists under the Brazilian name of Paca for more than 200 years, being described by LERY in 1578. It was described and figured by Marcgrave under the same name in 1648; and Ray, Buffon, Cuvier, and other naturalists, have described it under the same title. Fred. Cuvier has called it Cœlogenus (hollow cheek), from the deep groove under the broad zygomatic arch on each side of the head. The Paca is one of the largest known Rodentia, or Glires, and is distinguished from the other genera of that order, by having five toes on each of the fore and hind feet, and by the deep hollow in each cheek. Daubenton has minutely described the anatomy, and figured the internal organs, of many animals of this order from the New World, nearly allied to the Paca, as the Agonti, the Guinea-pig, &c.; but he has not figured any of the soft parts of the Paca,—and the few observations he has given on its anatomy, being taken from a very young specimen not larger than a rat, are sometimes inaccurate, and are quite inapplicable to the adult animal. He states that only one branch came off from the arch of the aorta, whereas in the adult animal I have found two distinct branches, as in most other quadrupeds. He found the cæcum not 2½ inches long, whereas in the adult it is nearly 19 inches in length. The whole intestinal canal he found to be 7 feet in length, whereas in the adult it measures upwards of 30 feet. Cuvier has enlarged Daubenton's measurements of the intestinal canal, but neither he nor any succeeding anatomist appears to have added to our knowledge of the internal structure of this animal. As the very young specimen dissected by Daubenton was a female, the male Paca, to which the following observations relate, does not appear to have been hitherto dissected.

Daubenton states, that the Paca possesses clavicles, and, in his figure of the skeleton, he has represented them as complete, and uniting with the acromion of the scapula. If, however, the clavicles had been complete in this animal, it would have formed an exception to the group of American *Glires*, to which it belongs, as they are incomplete in the Agonti, the Guinea-pig, and the Capibara. Cuvier has placed the Paca among the Rodentia that possess imperfect clavicles, as he has done the Capibara, which he states in his *Leç. d'An. Comp.* (i. 245) to have no clavicle whatever. Later writers have followed his example in giving imperfect clavicles to the whole group. In the Paca the clavicle consists of a small cylindrical bone, about a line in diameter, 1¼ inch in length, considerably enlarged at each end, and which does not reach either the sternum or the scapula. A cylindrical compressed cartilage, three-fourths of an inch long, is attached to the sternal extremity of the clavicle, and plays loosely on the inner surface of the sternum in a wide capsule. There is no articular surface at the upper part of the sternum for the attachment of the clavicle. The scapular extremity of the clavicle has a soft irregular piece of cartilage only two lines long attached to it, which is only connected by cellular substance with the muscles of the neck, and the acromion of the scapula has no articular surface. The muscles of this animal had a pale and wasted appearance, and there was scarcely any adipose substance either on the external or internal parts of the body, which may have been owing to the lingering consumption of which it died. Numerous tubercles existed in the substance of the pleura costalis at the sides of the vertebræ; they were spread over the surface and through the whole texture of the lungs to such an extent, as to cause large parts of these organs to sink when immersed in water; they abounded on the pericardium, on the large arterial trunks, on both sides of the diaphragm, on the coats of the intestinal canal, on the surface and through the whole substance of the liver; the pancreas and the spleen were masses of tubercles; they were spread over the peritoneum, they extended through the substance of the kidneys to the parietes of the pelves; and the bronchial and mesenteric glands were very much enlarged and hardened, exhibiting the same firm cheesy consistence as the whole of the tubercles. No hydatids were found in any of these organs; but I have found on the omentum of the domestic rabbit large specimens of the *hydatis pisiformis* Lam., while the liver of the same animal was entirely traversed with small, hard tubercles.

The cartilaginous rings surrounding the trachea, and its principal branches in the Paca, cover four-fifths of the circumference of these tubes, as in the Guinea-pig. The lungs are divided into three lobes on each side of the chest, and the heart lies in a longitudinal position on the mesial line. Each lung was similarly divided, by two transverse fissures, into three lobes; the smallest of which tapered upwards to the imperfect clavicle, the lowest was considerably the largest, and the middle lobe was bounded, above and below, by two flat and parallel surfaces. A very small additional lobe, about an inch in length, and much divided, was placed at the lower and back part of the right lung, making four lobes on the right side, as in most other quadrupeds. The heart was comparatively small, soft, and pale coloured. The right cavities were more thin and flaccid than is commonly observed; there was no opening at the place of the foramen ovale; the opening and sinus of the coronary veins were unusually wide, and terminated on the right side of the right auricle, immediately above the entrance of the inferior cava. From the longitudinal position of the heart in the middle of the thorax, with its apex directed to the centre of the diaphragm, the inferior cava passed upwards about 3 inches, after perforating the diaphragm, before it reached the right auricle. The muscular fasciculi in the right auricle were disposed in regular arborescent forms. The tricuspid, mitral and semilunar valves, presented nothing peculiar; but the fleshy columns of the right ventricle were more than usually prominent and numerous. All the cavities of the heart were distended with firm coagula of blood, but no tubercle appeared on any part of the organ. The heart had a compressed, ovate form, measuring 1¾ inches in its greatest breadth, and 2¼ inches from the base to the apex. Two branches were given off from the arch of the aorta, as in other quadrupeds. The pericardium was thicker and stronger than we generally find it in Rodentia. The phrenic nerves, and the nerves generally, of this animal were large and distinct. The Paca is stated by Lacepede to possess a remarkable sensibility, and its surface is covered only with a loose bristly hair, like that of a hog.

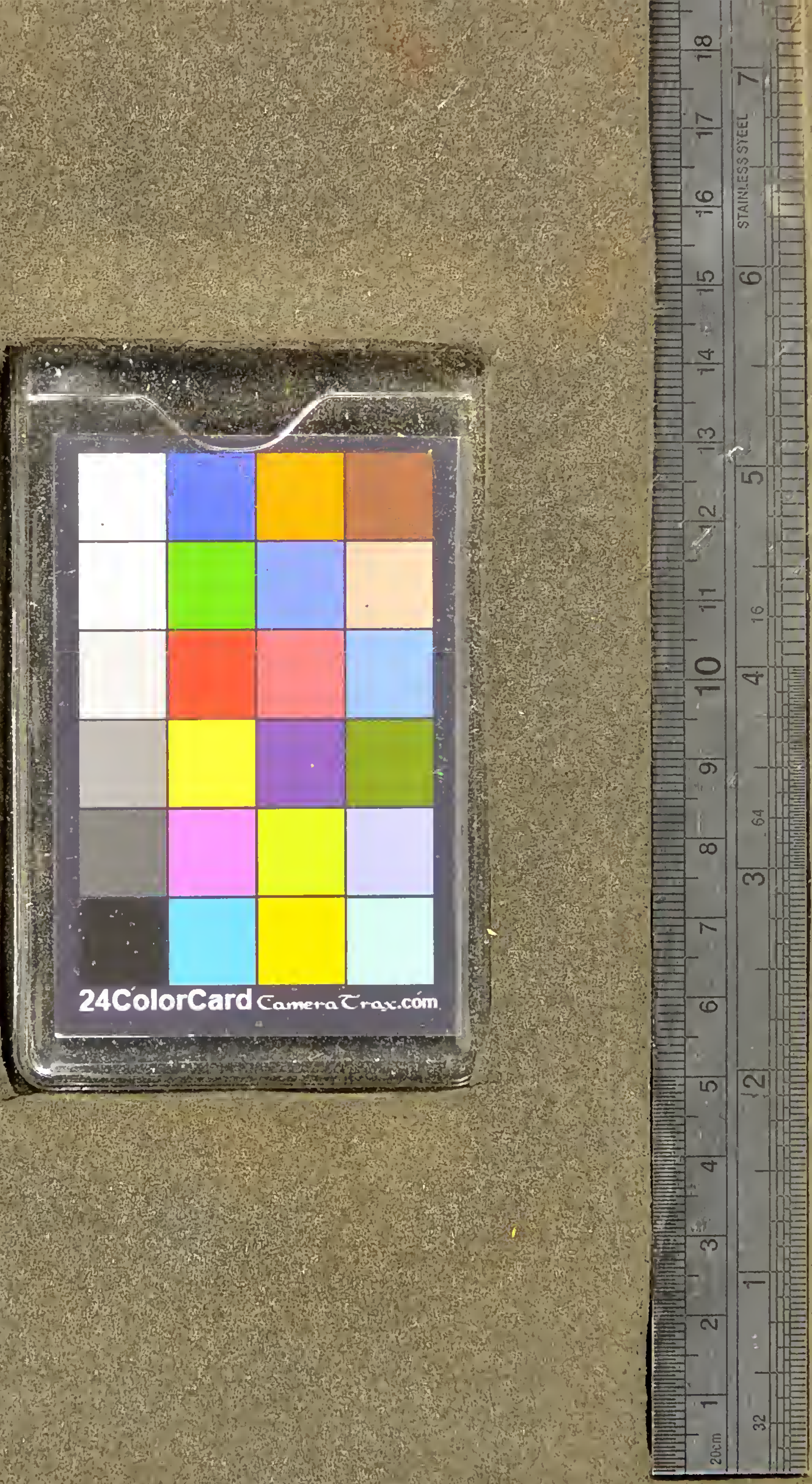
The great length of the intestinal canal, and the size of the stomach and cœcum, point out more distinctly than the chisel-shaped fore teeth, the kind of food on which this animal naturally subsists. The specimen I examined was fed, during its confinement, on potatoes boiled or unboiled, loaf-bread, apples, cabbage, or almost any kind of vegetables. In their natural state, these animals live on herbs, or shrubs, or dig up from the ground with their very long claws succulent roots, as we observe done by the common hog. The Paca resembles the hog in the great size of the back part of the abdomen, and in the grunting sound it frequently produces. The œsophagus entered near the middle of the upper margin of the stomach, leaving a portion on the left side like a cæcum, 3 inches in length. The cardia was thick and muscular, the stomach smooth internally, and with thin parietes, and the pyloric extremity was suddenly contracted by a narrow ring at its entrance into the very wide commencement of the duodenum. The stomach lay chiefly on the left side, and tapered regularly from the left to the right extremity; when moderately inflated, it measured 8 inches in a straight line from left to right. The small intestines, from the pylorus to the cæcum coli, measured 21 feet; the cæcum coli measured 19 inches in length; and the large intestines, from the cæcum to the anus, were 11 feet long. The commencement of the duodenum was so much dilated, as to form a small cæcum an inch long above the pyloric orifice, the dilated part of the duodenum continued about 4 inches from the pylorus. The rest of the small intestine had a uniform appearance, and was about an inch in diameter. The ilium terminated by a valvular orifice, in a wide and convoluted cæcum, 2½ inches in diameter, deeply divided by internal transverse plicæ, marked externally by longitudinal bands, and extending from the left to the right iliac region. The cæcum formed two complete spiral turns, and tapered regularly to its shut extremity. The passage leading from the cæcum into the colon was placed near that of the ilium, at the wide commencement of the cæcum. The first ten inches of the colon were nearly as wide as the cæcum, and turned between its convolutions. This dilated part of the colon exhibited a corded appearance, produced by numerous small longitudinal plicæ of the inner membrane. The whole remainder of the colon and the rectum had the same diameter and general appearance as the small intestines. Immediately on escaping from the spiral turns of the cæcum, the colon doubled itself, and formed a small circular disk of convolutions lying in the same plane, and connected together by mesocolon. The colon, more than ten feet long, had no external longitudinal bands, nor the slightest puckering of its coats.

The liver was divided, by distinct fissures, into six lobes, increasing progressively in size from the right to the left side, and rather more than half of the organ lay on the left of the mesial plane. The gall-bladder lay between the two central lobes, firmly attached to them by cellular substance. A single hepatic duct joined the cystic duct about three inches from its termination in the duodenum, and the ductus communis choledocus entered the intestine about four inches below the pylorus. The gall-bladder contained no bile, but about an ounce of a thick brown-coloured opaque fluid, and a small biliary concretion, two lines in diameter, with a rough, irregular and dark-brown surface. This gall-stone was white, and hard internally, but did not effervesce in nitric acid. The spleen, somewhat reniform, and much enlarged and hardened by disease, lay beneath the stomach on the left side. The pancreas resembled that of the rabbit, in form, colour, and situation. The kidneys, 2½ inches long, and 1¼ broad, were placed nearly on the same level, the right being only about a quarter of an inch higher than the left. In the rabbit I have sometimes observed the right kidney nearly two inches higher than the left. The kidneys had the usual regular lengthened form, without any appearance of lobes, which are observed generally in carnivorous animals. The supra-renal glands, attached to the upper and inner margin of the kidneys on the outside of their capsule, were of great size in the Paca, as has been observed also in some other Rodentia. They were of a pale flesh-red colour, 1½ inch in length, half an inch broad, and formed about a twelfth part of the bulk of the kidneys. On laying these glands open, a shut cavity was found in their middle, extending their whole length, the walls of which had a fibrous structure, very much resembling the parenchymatous texture of the kidneys. The use of these glands is not known. Their central cavity was filled with a soft, red, homogeneous substance, like a coagulum of arterial blood. The pelves of the kidneys were very small. The ureters of the diameter of a crow-quill, terminated very obliquely, about an inch from each other, at the lower and back part of a long pyriform urinary bladder. The urinary bladder, consisting of thin and delicate coats, measured 4 inches from the fundus to the neck, when moderately inflated.

The male organs of generation of this animal exhibit a very singular and complicated structure, and, in many circumstances, resemble those described by Daubenton in the Agonti. I found both testicles within the abdomen, and connected in the usual way with the sides of the abdominal ring. From the great width and looseness of the ring on which the testes lay, it is very probable that they descend from the cavity of the abdomen through the ring during the rutting season, as in many other animals. The epididymis was much smaller than that of an ordinary sized rabbit, and formed the lower end of the testicle. The *vasa deferentia* formed two strong white cords, a line in diameter, and considerably longer than those of the Agonti. They passed between the vesiculæ seminales and the bladder, and entered the urethra separately, at a small recess, protected by a fold of the inner membrane, and at the distance of nearly an inch from the neck of the bladder. The *vesiculæ seminales*, lying between the bladder and rectum, consisted of two large hard distended sacs, of unequal lengths, and with very irregular lobed surfaces. The right measured 2½ inches long, the left 2 inches, and they were nearly an inch broad. These sacs were distended with a very thick white opaque fluid, and entered the urethra by separate orifices, in the same valvular recess with the *vasa deferentia.* The *vesiculæ seminales* had no peduncle whatever, but continued broad and lobed to their termination in the urethra, although, in the Agonti, they terminate each in a long duct, before reaching the urethra. Daubenton took from the urethra of the Agonti a long firm white substance with a shining fracture, which appeared to be formed by the hardened matter of the vesiculæ seminales; nothing similar existed in the urethra of the Paca. The two prostrate glands lay on the opposite sides of the neck of the bladder, and below the terminations of the *vesiculæ seminales.* They formed two very soft broad glandular expansions, of a flesh-red colour, and appeared as if composed of several long narrow glands attached to each other. These glands opened directly into the urethra, at the same place with the seminal ducts. As the fringed margins of all these ducts projected freely into the valvular recess of the urethra, their openings were protected by a double valvular apparatus, from any objects passing along the urethra. Two regular pear-shaped glands, which have been met with in a few other animals, but whose use is still unknown, were placed on the sides of the rectum, and in contact with the last caudal vertebræ. The glands were about half an inch in length and breadth, of a dark-grey colour, very soft, and contained a thick grey coloured fluid, which was conveyed by two separate ducts, more than an inch long, into the urethra, at the lower and fore part of the bulb. These glands had a loose cellular internal texture, and their ducts entered the urethra at the distance of two inches from the openings of the seminal ducts. The penis measured 5 inches from the bulb of the urethra to the point of the glans, from the bulb to the entrance of the seminal ducts 2 inches, and these ducts entered the urethra about an inch from the neck of the bladder. The glans penis was

$1\frac{1}{2}$ inch long, and the penis was throughout about half an inch in thickness. The glans was nearly cylindrical, slightly dilated on the fore part, and supported by a complicated bony apparatus. It presented a wide funnel-shaped cavity, unconnected with the urethra, and opening on the fore part by loose soft margins. This cavity, like the whole surface of the glans, was covered with small sharp curved spines, which were reflected backwards on the glans, and forward in the cavity. These spines, when viewed with a lens, were seen to be hollow curved cones, shaped like the horns of the rhinoceros. The whole extent of the upper surface of the glans was strengthened by a bony plate, much expanded at its back part, and affording attachment to two long sharp styliform bodies, whose points reached the anterior extremity of the funnel-shaped cavity of the glans. At the sides of the bony support of the glans, were placed two remarkable serrated osseous wings, with four or five sharp reflected teeth on their free margins. These bony serrated plates were loosely connected with the soft parts of the penis, and rose erect on stretching the integuments to which they were attached; their surface has a smooth shining pearly lustre, like the two sharp styliform bones within the cavity of the glans. The urethra, lying immediately beneath the osseous support of the penis, terminated within the anterior and upper margin of the funnel-shaped cavity.

The great developement and peculiar character of the digestive system of this timid and defenceless animal, admirably adapt it for quickly converting vegetable into animal matter, and for checking the excesses of a luxuriant vegetation in the wilds it inhabits. The remarkably developed state of its generative system, the great fertility of the animal, and its peculiar propensities, cause it to multiply exceedingly in the warm and fertile deserts of the New World, where it dwells secure in its subterranean burrows, remote from the howl of the lion, the leopard, the hyæna, the panther, the tiger, or the other carnivorous monsters of Africa and Asia,—and where its abundant food is neither shared nor trampled by the elephant, the camel, the dromedary, the rhinoceros, nor the giraffe. It has spread so immensely over these waste plains, that it affords an inexhaustible supply of agreeable and wholesome food, already prepared to reward the enterprise and industry of man, in peopling and cultivating the rich solitudes of South America.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